FLEXIBILITY-BASED SUBSTRUCTURAL VIBRATION ANALYSIS

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A variational formulation is presented, which leads to a general form of partitioned equations of motion for structures. The present partitioned equations are shown to be suitable for developing a family of structural component mode synthesis methods. Two new forms of component mode synthesis methods are derived by introducing different approximations to the present partitioned equations that can be implemented on both sequential and parallel computers. For each approximation, a corresponding substructural mode selection expression is identified, which can be used for a rational mode selection criterion for each substructure. New forms of component mode synthesis methods have been implemented , which show that the present flexibility-based component mode synthesis formula outperforms the stiffness-based method, including the Craig-Bampton method for simple plates and ring model with solid elements. As the flexibility-based method does require a tree-like hierarchical decomposition, it is recommended for parallel implementation. A hierarchy-free algorithm for reducing the interface degrees of freedom is presented as an alternative to a tree-structure architecture that has been adopted in implementing the Craig-Bampton method for parallel computations.

References

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